

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year)
09 August 1999 (09.08.99)

International application No.
PCT/US98/18088

Applicant's or agent's file reference
RCA 88795

International filing date (day/month/year)
01 September 1998 (01.09.98)

Priority date (day/month/year)
12 December 1997 (12.12.97)

Applicant

KNUTSON, Paul, Gothard et al

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
29 June 1999 (29.06.99)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
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1211 Geneva 20, Switzerland

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Authorized officer

Kiwa Mpay

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PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)

To

TRIPOLI, J.
THOMSON MULTIMEDIA LICENSING INC.
P.O. Box 5312
Princeton, New Jersey 08543
ETATS-UNIS D'AMERIQUE

Date of mailing
(day/month/year)

15. 03 00

Applicant's or agent's file reference
RCA 88795

IMPORTANT NOTIFICATION

International application No.
PCT/US98/18088

International filing date (day/month/year)
01/09/1998

Priority date (day/month/year)
12/12/1997

Applicant

THOMSON CONSUMER ELECTRONICS, INC. et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/



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D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
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Mader, D

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference RCA 88795		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) FOR FURTHER ACTION	
International application No PCT/US98/18088	International filing date (day/month/year) 01/09/1998	Priority date (day/month/year) 12/12/1997	
International Patent Classification (IPC) or national classification and IPC H04B7/26			
Applicant THOMSON CONSUMER ELECTRONICS, INC. et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 8 sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input checked="" type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input checked="" type="checkbox"/> Certain observations on the international application 			
Date of submission of the demand 29/06/1999		Date of completion of this report 15. 03. 00	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized officer Giglietto. M Telephone No. +49 89 2399 8214 	

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US98/18088

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1.3-12 as originally filed

2.2a.13 as received on 29/02/2000 with letter of 29/02/2000

Claims, No.:

1-25 as received on 29/02/2000 with letter of 29/02/2000

Drawings, sheets:

1/3-3/3 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description. pages:
☐ the claims. Nos.:
☐ the drawings. sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US98/18088

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-25
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-25
Industrial applicability (IA)	Yes:	Claims	1-25
	No:	Claims	

2. Citations and explanations

see separate sheet

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Citations:

D1: PATENT ABSTRACTS OF JAPAN vol. 098, no. 002, 30 January 1998 & JP 09 284380 A (SONY CORP), 31 October 1997

D2: EP-A-0 399 611

D3: WO-A-98 39941

D4: US-5654901

The document D4 was not cited in the international search report. A copy of the document is appended hereto.

2. The present application comprises three independent claims, i.e. claims 1, 10 and 19, directed to a wireless telephone system, a method and a base unit of a wireless telecommunication system respectively.

2.1 Claim 1 is directed to a wireless telephone system comprising inter-alia a base unit having an interface circuitry for interfacing with an external computer. Said system is characterized in that: **a)** the interface circuitry comprises means for combining and routing of telephone calls in accordance with a system configuration; **b)** the interface can communicate with the computer to change said system configuration.

The definition of wireless telephone system extends also to cellular telephone systems such the GSM or the CDMA systems (cf. e.g. page 13, lines 13-15). It is already known from such prior-art cellular systems that base units comprise means for routing of calls under the control of a processor and means for communicating to an external computer. An example of such a system is given in document D4 that shows (cf. e.g. D4, Fig. 2) a base station unit (BTS) connectable to an Operation and Maintenance Terminal (OMT) to upgrade the software version of the BTS. A generic system configuration modification feature is also known from the GSM system specifications (cf. e.g. carrier frequencies

assignment to a cell. etc.). The only difference between claim 1 and the prior-art appears to be the feature of combining at the base unit.

The feature of combining calls is not clear (see section VIII) and it can be interpreted both as referring to combining of signals at the antenna and as referring to mixing of voice signals for applications such as teleconference systems. In the former case this feature is already known from the base stations for cellular systems and claim 1 would **not be new** (Art. 33(2) PCT); in the latter case, said feature is usually performed at the switching center. According to this interpretation, the problem to be solved by the present invention may therefore be regarded as how to simplify the combining of the phone calls among handsets connected to the same base station unit.

However, a person skilled in the art would easily foreseen the advantages and the drawbacks of locating the combining feature at the base unit (i.e. limited to phone calls among handset communicating in the same cell); it would be obvious to the person skilled in the art, namely when the same result is to be achieved, to apply these features with corresponding effect to a system according to document D4, thereby arriving at a system according to claim 1. Consequently, the subject-matter of **claim 1 lacks an inventive step** (Article 33(3) PCT).

3. Claims 10 and 19 are the method claim and base unit claim corresponding to claim 1 and therefore also lack an inventive step (Article 33(3) PCT).
4. The dependent claims do not contain any additional features which in combination with the features of any claim to which they refer, would satisfy the requirement of inventive step for the following reasons:

- **claims 2, 3, 5, 11, 12, 14, 20 and 21, 23** add further features (data buffers, a RAM for storing the system configuration, a control unit) which do not appear to add any inventive characteristic to claims 1, 10 and 19;
- **claims 4, 13, 22** merely relate to the feature of comprising, among others, voicemail, conference calls services that are standard telephone services and do not appear to add any inventive characteristic to claims 1, 10 and 19;
- **claims 6, 15, 24** do not add any clear inventive feature to the independent claims (establishing which is a main line and a rollover line);

claims 7 and 16 merely specify a radio transmission access (TDMA) which is generally known in the art and also shown in D2 (cf. e.g. Figs. 1 and 2). Since no surprising effect can be seen in selecting a TDMA radio interface, the TDMA is merely one of several design possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill. Thus, the subject-matter of claims 7 and 16 does not involve an inventive step and does not satisfy the criterion set forth in Article 33(3) PCT;

claims 8 and 17 merely add the feature of the computer being connected via an external port to provide generic additional features to the system which is known from D1. The additional feature of the port having a bandwidth sufficient to support the provided features appears to be an obvious design choice for the skilled person when faced with the problem of providing a given feature through a communication channel such as the aforementioned port. Therefore, the subject-matter of claims 8 and 17 does not involve an inventive step and does not satisfy the criterion set forth in Article 33(3) PCT;

claims 9, 18 and 25 merely add the feature of a second computer interface for interfacing with a second system which appears to fall within the teaching of document D1 and D4 and therefore the solution proposed in claims 9, 18 and 25 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT).

Re Item VI

Certain documents cited

Certain published documents (Rule 70.10)

Application No			
Patent No	Publication date	Filing date	Priority date (valid claim)
(day/month/year)			
(day/month/year)			
(day/month/year)			
WO-A-9839941	11.09.1998	04.03.1998	06.03.97

The International Patent Application WO-A-9839941 (D3) published on the 11.09.1998, claims the priority date of 06.03.97.

Its content is therefore considered relevant regarding novelty since it discloses (cf. e.g.

D3, Fig. 1): a wireless telephone system, multiple handsets (15), a base unit (20) communicating with each handset over an RF channel, an interface (25) for interfacing with an external computer (40), said interface comprising a processor (cf. e.g. Fig. 2, 70) for selectively combining and routing telephone calls (cf. e.g. page 1, line 27), wherein the computer can communicate with the processor to change the system configuration (cf. e.g. page 2, lines 21-24) and no clear difference compared to the subject-matter of the current application can be found.

Re Item VIII

Certain observations on the international application

1. Although the description appears to refer to the wording "combining" with reference to teleconference services, the same wording could also be interpreted as the operation performed at the base unit before transmitting the signals of the plurality of channels from a single antenna which is a known feature of a base station for a cellular telephone system.

However, it may be difficult to set up such systems, and to control or access the data within the system. For example, it may be difficult, cumbersome, or impossible to set up or change call routing as desired. This can be especially true in wireless phone systems that do not include sophisticated user interface and user-programmability, and associated peripherals, processors, architecture, and the like. See, e.g., European Pat. App. No. EP-A-0 399 611 (Philips Electronics UK Limited), published 28.11.90, for an exemplary wireless phone system. Such wireless system typically do not contains such features as they are often designed to be relatively inexpensive. These limitations can impair the utility of wireless telephone systems.

Patent Abstracts of Japan, vol. 098, no. 002, 30 January 1998 & JP 09 284380 A (Sony Corp.), 31 October 19979, discloses a telephone terminal, information service device, destination information registration system, and destination information registration method in which a portable telephone sends an acquired telephone number to a base unit, and the base unit sends the received telephone number to a personal computer via a communication interface. European Pat. App. No. EP-A-0 399 611 (Philips Electronics UK Limited), published 28.11.90, discloses a communications system for data transmission over a time-division duplex frequency channel.

SUMMARY

A wireless telephone system comprises one or more wireless handsets and a base unit. Each handset has a handset transceiver. The base unit has a base transceiver for communicating over an RF channel with each handset via its handset transceiver. The base transceiver also includes an interface for interfacing with an external computer, wherein the computer, when interfaced with the base unit via the interface, can control the operation of the wireless telephone system.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of TDMA multi-line wireless telephone system, in accordance with an embodiment of the present invention;

Fig. 2 is a schematic representation of the architecture of the base station of the system of Fig. 1, in accordance with an embodiment of the present invention; and

Fig. 3 is a flow diagram illustrating the data flow of a telephone call combiner operation implemented by the base station of the system of Fig. 1, in accordance with an embodiment of the present invention.

SUBSTITUTE SHEET

channel from the handsets, to save bandwidth, and thus must be decompressed before being applied to combiner 230. The compressed data may be, for example, in adaptive differential pulse code modulation (ADPCM) format. Thus, for example, an RF signal is received by receiver 121 from a handset, to provide an ADPCM signal, and then decompressed by codec 231, to provide a linear PCM signal. A second signal may be provided, also in compressed form (e.g., to save memory), by processor 250 (or from a processor of PC 140), to the decomposition of codec 231 via MUX 301. This may be a signal retrieved from memory, that is to be combined with the handset audio signal, or another handset signal that after being processed by processor 250. Combiner 230 can then combine two or more of the signals from the handset, from processor 250, or from an external telephone line (POTS A/D line, via codec 210). The combined or merged signal is then transmitted out to the appropriate recipients. Alternatively, all audio signals could be transmitted via interface 254 to PC 140, for combining, or for compression and decompression.

One skilled in the art will recognize that the wireless system described above according to the principles of the invention may be a cellular system where base unit 110 represents a base station serving one of the cells in a cellular telephone network.

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CLAIMS

1. A wireless telephone system (100), comprising:
 - (a) a plurality of wireless handsets (120), each handset (120_i) comprising a handset transceiver (121, 122); and
 - (b) a base unit (110) comprising a base transceiver (111, 112) for communicating over an RF channel with each handset via its handset transceiver; and an interface (130) for interfacing with an external computer (140), characterized in that said interface comprising: a processor (250), and a phone call linear combiner (230) for selectively combining and routing telephone calls in the system under the control of the processor in accordance with a system configuration, wherein the computer, when interfaced with the base unit via the interface, can communicate with the processor to change the system configuration.
2. The system of claim 1, wherein said interface further comprises a first voice data buffer (241) for receiving voice signals from the processor (250) to be sent to the combiner (230) and a second voice data buffer (242) for receiving voice signals from the combiner (230) to be sent to the processor (250).
3. The system of claim 1, wherein said interface further comprises a control unit (243) for controlling the combiner (230) under the control of the processor (250).
4. The system of claim 1, wherein the selective combining and routing of telephone calls by combiner (230) under the control of the processor (250) comprises at least one of: routing calls from external phone lines (115) to selected handsets (120) or to voice buffers (241, 242) coupled to the processor (250); connecting selected handsets (120) to the processor (250) to retrieve voicemail stored in a RAM (251) of the interface; and merging multiple handsets (120) and/or phone lines (115) to provide conference calls.

5. The system of claim 1, wherein said interface (130) further comprises a RAM (251) for storing system configuration data received from the external computer (140).

6. The system of claim 1, wherein a given system configuration provided via said external computer (140) further specifies at least one of: which external phone line (115) is a main line and which are rollover lines; the extension numbers of each of the handsets (120); which handset (120) is in secretary mode; and which handsets (120) are added or deleted from the telephone system (100).

7. The system of claim 1, wherein the base transceiver establishes a time-division multiple access (TDMA) link over said RF channel with each handset via the handset transceiver in accordance with a TDMA time slot structure allocating exclusive audio packet time slots to each handset.

8. The system of claim 1, wherein the computer (140) further provides one or more features to the system (100), the system further comprising an external port (254) coupled to interface (130), the external port and the interface having a bandwidth sufficient to support the provided features.

9. The system of claim 1, further comprising a second interface for interfacing with a second wireless telephone system, under the control of the external computer (140) to expand overall system size.

10. In a base unit (110) of a wireless telephone system (100) having the base unit and a plurality of wireless handsets (120), the base unit comprising a base transceiver (111, 112), each handset (120) comprising a handset transceiver (121, 122), a method comprising the steps of:

- (a) communicating over an RF channel with each handset via the base transceiver and the handset transceiver;
- (b) interfacing with an external computer (140) via an interface (130) of the base unit; and
- (c) controlling, with a processor (250), a phone call linear combiner (230) of the interface;

(d) selectively combining and routing telephone calls in the system, with the combiner (230), under the control of the processor (250) in accordance with a system configuration; and

(e) communicating, with the computer (140), with the processor (250) when interfaced with the base unit via the interface to change the system configuration.

11. The method of claim 10, wherein said interface further comprises a first voice data buffer (241) for receiving voice signals from the processor (250) to be sent to the combiner (230) and a second voice data buffer (242) for receiving voice signals from the combiner (230) to be sent to the processor (250).

12. The method of claim 10, wherein said interface further comprises a control unit (243) for controlling the combiner (230) under the control of the processor (250).

13. The method of claim 10, wherein the selective combining and routing of telephone calls by combiner (230) under the control of the processor (250) comprises at least one of: routing calls from external phone lines (115) to selected handsets (120) or to voice buffers (241, 242) coupled to the processor (250); connecting selected handsets (120) to the processor (250) to retrieve voicemail stored in a RAM (251) of the interface; and merging multiple handsets (120) and/or phone lines (115) to provide conference calls.

14. The method of claim 10, wherein said interface (130) further comprises a RAM (251) for storing system configuration data received from the external computer (140).

15. The method of claim 10, wherein a given system configuration provided via said external computer (140) further specifies at least one of: which external phone line (115) is a main line and which are rollover lines; the extension numbers of each of the handsets (120); which handset (120) is in secretary mode; and which handsets (120) are added or deleted from the telephone system (100).

16. The method of claim 10, wherein step (a) comprises the step of establishing, with the base transceiver, a TDMA link over the RF channel with each handset via the handset transceiver in accordance with a TDMA time slot structure allocating exclusive audio packet time slots to each handset.

17. The method of claim 10, wherein step (c) further comprises the step of providing one or more features to the system, the system further comprising an external port coupled to interface, the external port and the interface having a bandwidth sufficient to support the provided features.

18. The method of claim 10, comprising the further step of interfacing with a second wireless telephone system via a second interface, under the control of the computer (140), to increase the size of the system (100).

19. A base unit (110) of a wireless telephone system (100) comprising the base unit and a plurality of wireless handsets (120), each handset (120) comprising a handset transceiver (121, 122), the base unit (110) comprising:

- (a) a base transceiver (111, 112) for communicating over an RF channel with each handset via its handset transceiver; and
- (b) an interface (130) for interfacing with an external computer (140), characterized in that said interface comprising: a processor (250), and a phone call linear combiner (230) for selectively combining and routing telephone calls in the system under the control of the processor in accordance with a system configuration, wherein the computer, when interfaced with the base unit via the interface, can communicate with the processor to change the system configuration.

20. The base unit of claim 19, wherein said interface further comprises a first voice data buffer (241) for receiving voice signals from the processor (250) to be sent to the combiner (230) and a second voice data buffer (242) for receiving voice signals from the combiner (230) to be sent to the processor (250).

21. The base unit of claim 20, wherein said interface further comprises a control unit (243) for controlling the combiner (230) under the control of the processor (250).

22. The base unit of claim 20, wherein the selective combining and routing telephone calls by combiner (230) under the control of the processor (250) comprises at least one of: routing calls from external phone lines (115) to selected handsets (120) or to voice buffers (241, 242) coupled to the processor (250); connecting selected handsets (120) to the processor (250) to retrieve voicemail stored in a RAM (251) of the interface; and merging multiple handsets (120) and/or phone lines (115) to provide conference calls.

23. The base unit of claim 20, wherein said interface (130) further comprises a RAM (251) for storing system configuration data received from the external computer (140).

24. The base unit of claim 20, wherein a given system configuration provided via said external computer (140) further specifies at least one of: which external phone line (115) is a main line and which are rollover lines; the extension numbers of each of the handsets (120); which handset (120) is in secretary mode; and which handsets (120) are added or deleted from the telephone system (100).

25. The base unit of claim 20, further comprising a second interface for interfacing with a second wireless telephone system, under the control of the computer (140), to expand overall system size.

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference RCA 88795	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 98/18088	International filing date (day/month/year) 01/09/1998	(Earliest) Priority Date (day/month/year) 12/12/1997
Applicant THOMSON CONSUMER ELECTRONICS, INC. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (see Box I).

2. ☐ Unity of invention is lacking (see Box II).

3. ☐ The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing

☐ filed with the international application.

☐ furnished by the applicant separately from the international application.

☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

☐ Transcribed by this Authority

4. With regard to the **title**, ☒ the text is approved as submitted by the applicant

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is:

Figure No. 2 ☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☒ because this figure better characterizes the invention.

☐ None of the figures.

However, it may be difficult to set up such systems, and to control or access the data within the system. For example, it may be difficult, cumbersome, or impossible to set up or change call routing as desired. This can be especially true in wireless phone systems that do not include sophisticated user interface and user-programmability, and associated peripherals, processors, architecture, and the like. Such wireless system typically do not contains such features as they are often designed to be relatively inexpensive. These limitations can impair the utility of wireless telephone systems.

SUMMARY

A wireless telephone system comprises one or more wireless handsets and a base unit. Each handset has a handset transceiver. The base unit has a base transceiver for communicating over an RF channel with each handset via its handset transceiver. The base transceiver also includes an interface for interfacing with an external computer, wherein the computer, when interfaced with the base unit via the interface, can control the operation of the wireless telephone system

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of TDMA multi-line wireless telephone system, in accordance with an embodiment of the present invention;

Fig. 2 is a schematic representation of the architecture of the base station of the system of Fig. 1, in accordance with an embodiment of the present invention; and

Fig. 3 is a flow diagram illustrating the data flow of a telephone call combiner operation implemented by the base station of the system of Fig. 1, in accordance with an embodiment of the present invention.

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linear PCM data. Data is received in compressed format over the RF channel from the handsets, to save bandwidth, and thus must be decompressed before being applied to combiner 230. The compressed data may be, for example, in adaptive differential pulse code modulation (ADPCM) format. Thus, for example, an RF signal is received by receiver 121 from a handset, to provide an ADPCM signal, and then decompressed by codec 231, to provide a linear PCM signal. A second signal may be provided, also in compressed form (e.g., to save memory), by processor 250 (or from a processor of PC 140), to the decomposition of codec 231 via MUX 301. This may be a signal retrieved from memory, that is to be combined with the handset audio signal, or another handset signal that after being processed by processor 250. Combiner 230 can then combine two or more of the signals from the handset, from processor 250, or from an external telephone line (POTS A/D line, via codec 210). The combined or merged signal is then transmitted out to the appropriate recipients. Alternatively, all audio signals could be transmitted via interface 254 to PC 140, for combining, or for compression and decompression.

One skilled in the art will recognize that the wireless system described above according to the principles of the invention may be a cellular system where base unit 110 represents a base station serving one of the cells in a cellular telephone network.

It will be understood that various changes in the details, materials, and arrangements of the parts which have been described and illustrated above in order to explain the nature of this invention may be made by those skilled in the art without departing from the principle and scope of the invention as recited in the following claims.

CLAIMS

1. A wireless telephone system, comprising:
 - (a) one or more wireless handsets, each handset comprising a
5 handset transceiver; and
 - (b) a base unit comprising a base transceiver for communicating
over an RF channel with each handset via its handset
transceiver; and an interface for interfacing with an
external computer, wherein the computer, when
10 interfaced with the base unit via the interface, can control
an operation of the wireless telephone system.
2. The system of claim 1, wherein the one or more wireless
handsets comprises a plurality of wireless handsets.
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3. The system of claim 2, wherein the base transceiver
establishes a time-division multiple access (TDMA) link over said RF
channel with each handset via the handset transceiver in accordance
with a TDMA epoch allocating exclusive audio packet time slots to
20 each handset.
4. The system of claim 1, wherein the operation of the system
by the computer includes accessing features and data flows of the
system via the interface.
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5. The system of claim 1, wherein the computer provides one or
more features to the system, the system further comprising an
external port coupled to interface, the external port and the interface
having a bandwidth sufficient to support the provided features.

6. The system of claim 1, further comprising a second interface for interfacing with a second wireless telephone system.

5 7. The system of claim 1, wherein the computer, when interfaced with the base unit via the interface, provides one or more of the following features to the system: setting up an initial telephone system configuration; storing a current set up configuration locally; recording data from selected data flows within the system; selectively
10 routing and combining telephone calls and lines of the system; providing voice mail functions; providing conference calling functions; performing locally data compression or decompression for telephone system data; providing a hardware assist with a local computer processor to a base unit processor of the base unit; and providing for
15 caller ID-based call routing and screening.

8. In a base unit of a wireless telephone system having the base unit and one or more wireless handsets, the base unit comprising a base transceiver, each handset comprising a handset transceiver, a
20 method comprising the steps of:

- (a) communicating over an RF channel with each handset via the base transceiver and the handset transceiver;
- (b) interfacing with an external computer via an interface of the base unit; and
- 25 (c) controlling, with the interfaced external computer, an operation of the wireless telephone system.

9. The method of claim 8, wherein the one or more wireless handsets comprises a plurality of wireless handsets.

10. The method of claim 9, wherein step (a) comprises the step of establishing, with the base transceiver, a TDMA link over the RF channel with each handset via the handset transceiver in accordance
5 with a TDMA epoch allocating exclusive audio packet time slots to each handset.

11. The method of claim 8, wherein step (c) comprises the step of accessing features and data flows of the system via the interface.
10

12. The method of claim 8, wherein step (c) comprises the step of providing one or more features to the system, the system further comprising an external port coupled to interface, the external port and the interface having a bandwidth sufficient to support the
15 provided features.

13. The method of claim 8, comprising the further step of interfacing with a second wireless telephone system via a second interface, under the control of the computer, to increase the size of
20 the system.

14. The method of claim 8, wherein step (c) comprises the step providing one or more of the following features to the system: setting up an initial telephone system configuration; storing a current set up configuration locally; recording data from selected data flows within the system; selectively routing and combining telephone calls and lines of the system; providing voice mail functions; providing conference calling functions; performing locally data compression or decompression for telephone system data; providing a hardware assist with a local computer processor to a base unit processor of the base unit; and providing for caller ID-based call routing and screening.

15. A base unit of a wireless telephone system comprising the base unit and one or more wireless handsets, each handset comprising a handset transceiver, the base unit comprising:

- (a) a base transceiver for communicating over an RF channel with each handset via its handset transceiver; and
- (b) an interface for interfacing with an external computer, wherein the computer, when interfaced with the base unit via the interface, can control an operation of the base unit.

16. The base unit of claim 15, wherein:

the one or more wireless handsets comprises a plurality of wireless handsets; and

5 the base transceiver establishes a time-division multiple access (TDMA) link over a shared RF channel with each handset via the handset transceiver in accordance with a TDMA epoch allocating exclusive audio packet time slots to each handset.

10

17. The base unit of claim 15, wherein the operation of the base unit by the computer includes accessing features and data flows of the base unit via the interface.

15

18. The base unit of claim 15, wherein the computer provides one or more features to the base unit, the base unit further comprising an external port coupled to interface, the external port and the interface having a bandwidth sufficient to support the provided features.

20

19. The base unit of claim 15, further comprising a second interface for interfacing with a second wireless telephone system, under the control of the computer.

20. The base unit of claim 15, wherein the computer, when interfaced with the base unit via the interface, provides one or more of the following features to the base unit: setting up an initial
5 telephone system configuration; storing a current set up configuration locally; recording data from selected data flows within the base unit; selectively routing and combining telephone calls and lines of the system; providing voice mail functions; providing conference calling functions; performing locally data compression or decompression for
10 telephone system data; providing a hardware assist with a local computer processor to a base unit processor of the base unit; and providing for caller ID-based call routing and screening.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/18088

A. CLASSIFICATION OF SUBJECT MATTER
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04B H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	WO 98 39941 A (ERICSSON GE MOBILE INC) 11 September 1998 see abstract see page 1, line 1 - page 3, line 7 see page 4, line 16 - line 32 see claims 1,2; figures 1,2 ---	1-20
X	PATENT ABSTRACTS OF JAPAN vol. 098, no. 002, 30 January 1998 & JP 09 284380 A (SONY CORP), 31 October 1997	1,2,4,5, 7-9,11, 12,14, 15,17, 18,20
Y	see abstract ---	3,10,16
Y	EP 0 399 611 A (PHILIPS ELECTRONICS UK LTD ;PHILIPS NV (NL)) 28 November 1990 see abstract see claim 1; figures 1,2 ---	3,10,16
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☒ Further documents are listed in the continuation of box C.

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 593 118 A (KONINKL PHILIPS ELECTRONICS NV) 20 April 1994 see abstract see column 2, line 17 - line 22 see column 3, line 1 - line 8 see claim 5; figures 1,4 -----	1,2,8,9, 15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/18088

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 9839941	A	11-09-1998	AU	6540498 A	22-09-1998

EP 0399611	A	28-11-1990	GB	2232326 A	05-12-1990
			DE	69025353 D	28-03-1996
			DE	69025353 T	19-09-1996
			JP	3050926 A	05-03-1991
			US	5200956 A	06-04-1993

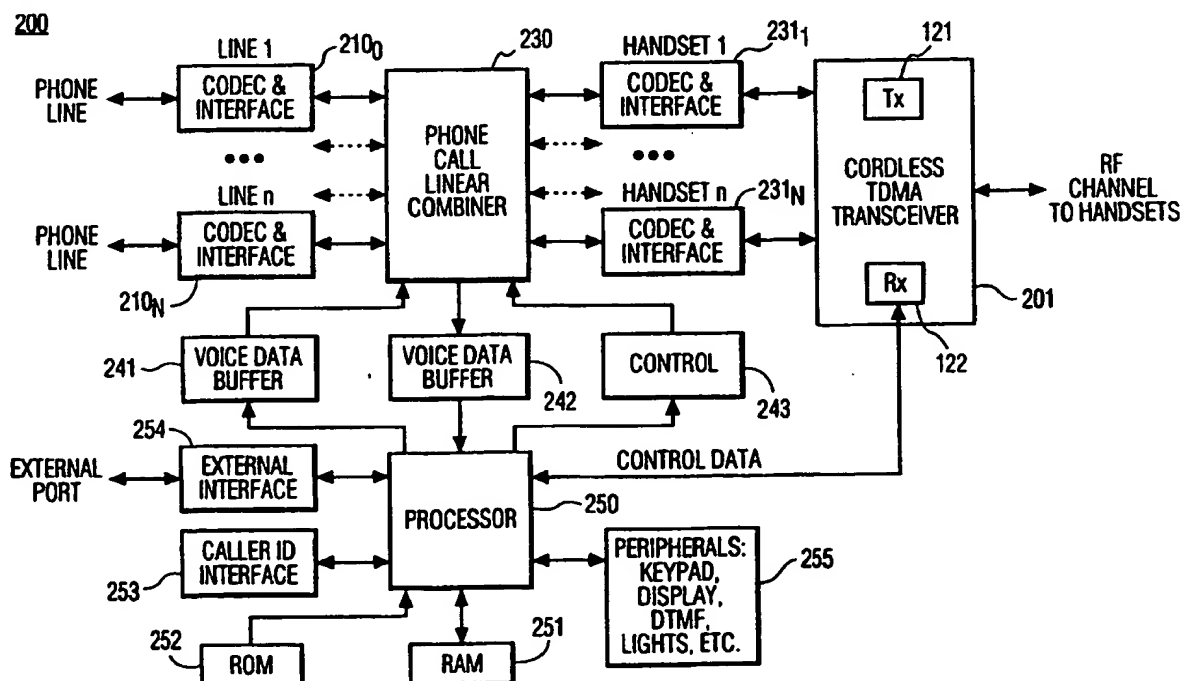
EP 0593118	A	20-04-1994	JP	6209281 A	26-07-1994
			SG	44867 A	19-12-1997
			US	5528667 A	18-06-1996



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(74) Agents: TRIPOLI, Joseph, S. et al.; GE & RCA Licensing Management Operation, Inc., P.O. Box 5312, Princeton, NJ 08540 (US).			

(54) Title: MULTI-LINE WIRELESS TELEPHONE SYSTEM COMPUTER INTERFACE



(57) Abstract

A wireless telephone system has one or more wireless handsets and a base unit. Each handset has a handset transceiver. The base unit has a base transceiver for communicating over an RF channel with each handset via its handset transceiver. The base transceiver also includes an interface for interfacing with an external computer, wherein the computer, when interfaced with the base unit via the interface, can control the operation of the wireless telephone system.

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MULTI-LINE WIRELESS TELEPHONE SYSTEM COMPUTER INTERFACE**BACKGROUND OF THE INVENTION****5 Field of the Invention**

The present invention relates to multi-line wireless telephone systems and, in particular, to interfacing between a computer and a time-division multiplexed (TDM) wireless telephone system.

Description of the Related Art

10 The use of telephones and telephone systems, including wireless telephone systems, is widespread. In wireless telephone systems, a wireless (cordless) telephone handset unit communicates via either analog or digital modulated radio frequency (RF) signals with a base unit, which is typically connected via one or more standard telephone
15 lines to an external telephone network. In this manner, a user may employ the wireless handset to engage in a telephone call with another, external, user through the base unit and the telephone network.

Multi-line wireless telephone systems are in use in various
20 situations, such as businesses with many telephone users. Such systems employ a handset that communicates with up to N handsets simultaneously, typically with digital communications schemes, such as a spread-spectrum, time division multiple access (TDMA). In a TDMA system, a single RF channel is used, and each handset transmits
25 and receives data during a dedicated time slice or slot within an overall cycle or epoch. It is desirable to provide various features, such as private branch exchange (PBX) features and capabilities, in a multi-line wireless telephone system.

However, it may be difficult to set up such systems, and to control or access the data within the system. For example, it may be difficult, cumbersome, or impossible to set up or change call routing as desired. This can be especially true in wireless phone systems that do not include sophisticated user interface and user-programmability, and associated peripherals, processors, architecture, and the like. Such wireless system typically do not contains such features as they are often designed to be relatively inexpensive. These limitations can impair the utility of wireless telephone systems.

SUMMARY

A wireless telephone system comprises one or more wireless handsets and a base unit. Each handset has a handset transceiver. The base unit has a base transceiver for communicating over an RF channel with each handset via its handset transceiver. The base transceiver also includes an interface for interfacing with an external computer, wherein the computer, when interfaced with the base unit via the interface, can control the operation of the wireless telephone system

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of TDMA multi-line wireless telephone system, in accordance with an embodiment of the present invention;

Fig. 2 is a schematic representation of the architecture of the base station of the system of Fig. 1, in accordance with an embodiment of the present invention; and

Fig. 3 is a flow diagram illustrating the data flow of a telephone call combiner operation implemented by the base station of the system of Fig. 1, in accordance with an embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to Fig. 1, there is shown a block diagram of spread spectrum TDMA multi-line digital wireless telephone system 100, in accordance with an embodiment of the present invention. TDMA system 100 comprises a base unit 110, which has receiver and transmitter units 112 and 111, respectively, and is coupled to external telephone network 116 via telephone line(s) 115. Base unit 110 also comprises interface 130, for providing interfacing between base unit 110 and an external computer such as personal computer (PC) 140.

System 100 also comprises N wireless handsets $120_1, 120_2, \dots, 120_N$. Each has a transmitter and receiver unit (transceiver), such as transmitter 121 and receiver 122 of handset 120_1 . In one embodiment, receiver unit 112 comprises N logical receivers, and transmitter unit 111 comprises N logical transmitters, so that receiver and transmitter units 112 and 111 provide N logical transceiver units, one for each of N wireless handsets. At any given time, M handsets ($0 \leq M \leq N$) are operating or "off hook" (i.e., in the process of conducting a telephone call).

The telephone system provided by system 100 preferably operates in the 900 MHz unlicensed band, and preferably provides features like that of a small PBX, in conjunction with PC 140. In one embodiment, system 100 employs a combination of time division multiplexing (TDM), such as TDMA, and frequency band selection, to overcome interfering sources and to maintain reliable links between the base unit and the handsets. In a digital TDMA scheme, each handset only transmits or receives data during its own "time slice" or slot allocated uniquely to it in the TDMA epoch. System 100 thus

provides a wireless TDM network between the base station 110 and each handset 120_i ($1 \leq i \leq N$).

As explained above, it may be difficult to set up such telephone systems, and to control or access the data within the system. For example, it may be prohibitively expensive to provide programmable configuration abilities into a base unit, or to provide an extensive set of input and output devices beyond the simple numeric keypads of the handsets and base unit. The present invention provides an interface to allow a telephone system, such as the telephone system comprising base unit 110 and handsets 120_i , to be coupled to an external computer, such as PC 140, to facilitate control and use of the telephone system. PC 140 itself is a sophisticated programmable device with adequate input and output devices (e.g., keyboard and mouse, monitor) to allow a user to have a great amount of control over the operations of telephone system 100.

For example, by using PC 140, the user may more easily set up, operate, and control telephone system 100, record data from selected data flows within system 100, route and selectively combine telephone calls and lines, provide various functions such as voice mail (including storage of voice mail messages and caller ID data), conference calling, caller ID functions and caller ID-based call routing and screening, data computational-intensive operations, such as audio or other data compression or decompression, and the like, as described in further detail below with reference to Figs. 2 and 3. In general, the ability of external PC 140 to set up, operate, and control telephone system 100, and to provide the various features and functions described herein, may be referred to as controlling the operation of the wireless telephone system.

In the present invention, the duty to perform certain tasks (e.g., non-real time tasks such as voice mail message storage) is shifted into PC 140 for storage efficiency and to minimize the memory and hardware requirements in telephone system 100. Embedding the various applications performable by PC 140 via interface 130 in base unit 110 would require memory, protocol, and other resources that may be too complex or expensive for a mere telephone system, as such systems are often designed to be relatively inexpensive. The present invention allows a relatively inexpensive digital wireless telephone system to be employed, having only the interface specified herein but not having all of the additional features, components, and functionality necessary to allow for user control of the operation of the telephone system, by providing these features from a PC coupled to the telephone system via the interface, and running relatively inexpensive software applications to provide these capabilities.

Referring now to Fig. 2, there is shown a schematic representation of the interface architecture 200 of the interface 130 of base station 110 of the telephone system of Fig. 1, in accordance with an embodiment of the present invention. Interface architecture 200 allows interfacing between PC 140 and base unit 110, to provide a plurality of useful functions and features, described in further detail below. Architecture 200 comprises transceiver 201 (which comprises transmitter 121 and receiver 122); codec & interfaces 231_1-231_N , one for each of handsets 120_1-120_N ; phone call linear combiner 230, codec & interfaces 210_1-210_N , each coupled to and for one of N external phone lines; voice data buffers 241, 242; control unit 243; embedded computer processor 250; ROM 252; RAM 251; peripherals 255, such as keypad, display, DTMF (dual tone multi-frequency) keys (i.e., keys 0-9, # and *, the symbols used in dialing), lights, and the like; caller ID

interface 253; and external interface 254, which is coupled to an external computer port for coupling to PC 140. External interface 254 may be a standard port such as a RS-232, ethernet, or universal serial bus-compatible interface, sufficient to provide a computer interface
5 port.

Codec & interfaces 231_1 – 231_N convert linear PCM (pulse code modulated) signals from combiner 230 into compressed format for transmission by transmitter 121 of transceiver 201, and convert compressed signals received from receiver 122 of transceiver 201
10 back into linear PCM signals to feed to combiner 230. Transceiver 201 takes compressed audio data from codecs 231 encodes this data for protection against RF channel errors, buffers the data until the appropriate time slot for the handset for which the data is destined, and transmits the data, with transmitter 121, at the time slot.
15 Transceiver 201 also receives data from handsets during their respective time slots, decodes channel coding for this data, and transmits compressed data to codecs 231 for decompression.

Phone call linear combiner 230 performs functions such as: routing calls from external phone lines to handsets or to processor
20 250; providing intercom functions; connecting handsets to the processor to retrieve voicemail; and merging multiple handsets and/or phone lines to make conference calls. Codec & interfaces 210_1 – 210_N convert analog POTS (plain old telephone service) signal to digital, and may contain a line echo cancellation function. Voice data
25 buffer 241 allows the processor 250 to send voice signals to combiner 230, which may then be routed to one or more handsets, as in the case of voice mail messages. In a multi-handset system such as system 100, multiple messages for several handsets can be conveyed from processor 250 to combiner 230 via buffer 241. Thus, for

example, voice mail messages can be retrieved from RAM 251 or from an external storage device associated with PC 140 via external interface 254. Similarly, voice data buffer 242 allows processor 250 to receive voice signals from combiner 230, such as receiving a message from a phone line and recording it. The recording may be stored in RAM 251, or transmitted across external interface 254 to an external storage device associated with PC 140. Control unit 243 controls combiner 230 and is used to set up combiner 230 to connect calls from phone lines to specified handsets or voice buffers 241, 242.

10 Embedded computer processor 250 controls system 100, such as transfers of data between interface and RAM 251, and the like. ROM 252 stores the program for processor 250 and all factory setups. RAM 251 stores operating information, temporary variables, and user configurations, and buffers data. RAM 251 may be backed up by a battery. Peripherals 255 handle I/O from base unit 110. For example, peripherals 255 indicate activity to the user (e.g., which lines are in use may be indicated by LEDs), and allow the user to set up the base unit 110 by using the base keypad/display functions of peripherals 255. Caller ID interface 253 may be implemented as an interface to external caller ID modem ICs, or can be an internal modem in hardware or software. Caller ID interface 253 interprets the signals from the call office indicating who originated the call, and makes this information available to processor 250 for indicating on a display of the handset or base, and/or logging in memory 251 or in PC 140 using interface 254. This allows important numbers to be given priority, for example ringing all handsets for high-priority incoming calls, instead of transferring to voice mail if there is no answer on a given handset. External interface 254 allows processor 250 to exchange data with an external computer such as PC 140.

Interface 130 in Fig. 1 is physically represented by external interface 254 of architecture 200, with software support by processor 250 and other functional support provided by the functional elements of architecture 200. Interface 130 thus provides a means for passing various types of data to and from PC 140 via the external computer port and, in particular, provides a means for allowing PC 140 to control and access internal data flows and other aspects of phone system 100. For example, some applications running on PC 140 may be designed to do something with data provided by telephone system 100, such as a voice mail application that can store messages on a storage device of the PC. Such applications need to be able to retrieve from and transmit to system 100 selected audio data. When such an application requires audio data, it needs to be able to read audio data from voice data buffers 241, 242, into the phone call linear combiner 230, and sum data into the ports of the phone call linear combiner 230, which combines and mixes calls. On the other hand, non-audio data transactions, such as those dealing with caller ID messages received from external phone lines, and configuration data used to configure or set up system 100, would not require voice data buffers 241, 242.

Embedded processor 250, in one embodiment, is sufficiently powerful to be able to move data around in real time. For example, processor 250 may provide voice mail by recording a voice message for a missed call, as well as the line number on which the call arrived, and optionally any caller ID data about the call. (For more computational-intensive operations, such as audio compression or decompression, one or more processors of PC 140 may be used to provide a hardware assist to processor 250.) A voice mail function, for example, requires that processor 250 capture audio samples in

real time from voice data buffer 242 (about 8,000 samples/second). These captured samples are then stored in RAM 251 within the system; or externally, in PC 140, via interface 254. Later, when the handset summons (requests) the stored voice mail message, processor
5 250 looks up the message in memory (or receives the data from PC 140 via interface 254), plays it back and presents identifying information (e.g., caller ID information) to the handset.

Voice data buffers 241, 242 serve as the interface between phone call linear combiner 230 and embedded processor
10 250/external interface 254. This allows data to be provided directly to the processor. Phone call linear combiner 230 may be used to combine telephone call data for various purposes, such as conference calling, under the control of PC 140. Thus, architecture 200 provides an interface that allows PC 140 to selectively combine telephone calls.

15 Interface architecture 200 provides a number of additional features and advantages as well, including storage of call logs in PC 140; voice mail services in PC 140 (e.g., where PC 140 stores an outgoing message as well as all incoming messages); backing up key system parameters, such as caller ID names; and allowing a VIP list
20 which will open lines via caller ID information by VIP users, such as customers.

Interface architecture 200 also provides a means to perform installation/set up/backup functions by PC 140. For example, such a functionality allows a user to quickly set up the desired features for
25 each handset of the phone system. As an example, a graphical interface on PC 140 may indicate the lines and handsets of system 100, and the human user of PC 140 may set up or configure the system by clicking on various line and handset representations on the screen. The user may indicate which is the main line, and which are

the rollover lines. (The main line receives first calls, and when more than one call comes in, the extra calls come in on a sequence of the other, rollover, lines.) The user may also set up the extension numbers of the handsets, and indicate which handset will be in secretary mode. A secretary phone may be used to display more caller ID information than a normal handset display allows. For example, a secretary computer screen may have a list of caller ID of all lines in the system. The user may also set up the outgoing voice mail messages.

10 A user may also add or delete handsets from telephone system, or add/enable/disable features to the phone system protocols. The present invention also allows the user to back up the configuration of the phone system in preparation for the unlikely event that the current configuration would require restoration, by
15 storing the current configuration data in a storage device of PC 140. Further, the user is enabled to install a system software upgrade through PC 140. PC 140 can be configured to provide to a user, from PC 140, various operational services, such as caller ID name table lookup; call logging; voice mail; VIP services (in which, e.g., if key
20 caller ID numbers come in, make sure they are answered); telemarketing services; and call routing services.

While it is often desirable to set up features in a computer-free mode, the installation application software could simplify the setup process for many users. Plus, given a reasonable bandwidth port,
25 additional features may be added to the system, in alternative embodiments. For example, one could use a bus such as the universal serial bus to connect multiple base stations together, under the control of PC 140, to add functionality such as an increase in overall system size. In this case, an additional digital port is provided, to

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allow for system expansion by allowing base station 110 to interface with multiple other base stations.

The external port coupled to external interface 254 has a bandwidth sufficient to support whichever PC-based features are provided. If PC 140 is used solely for relatively low-bandwidth tasks such as simple initialization and backup of features, an RS-232 port is sufficient. On the other hand, a much higher bandwidth port, such as an Ethernet adapter, is preferably used, for coupling to a local area network (LAN), when two spatially separated base stations are coupled together. Therefore, in one embodiment, a compromise approach is preferable in which a medium bandwidth interface is utilized, such as the universal serial bus (USB), to couple base unit 110 to local PC 140 near the base station. Such a medium bandwidth interface is also sufficient to provide network access or storage and monitoring capabilities, as well as basic setup functions.

Table 1 below shows bandwidth requirements and suitable interfaces for various applications, although those skilled in the art will understand that other suitable interfaces may also be used other than those listed in Table 1.

Application	Resources	Bandwidth	Interface
Answering Machine	audio, data	>32Kbps/channel	USB, ethernet
Call Logging	data	<1Kbps	USB, RS-232, ethernet
Expansion to additional Base	audio, data	>32Kbps/channel	USB, ethernet
Network Expansion	audio, data	>32Kbps/channel	USB to PC, ethernet
Internet Phone	audio, data	>32Kbps/channel	USB, ethernet
Telemarketing Assistant	audio, data	>32Kbps/channel	USB, ethernet
Software Upgrades	data	~10KBps	USB, RS-232, ethernet
Setup, save and restore features	data	~1Kbps	USB, RS-232, ethernet
Caller ID Table Check	data	~1KBps	USB, RS-232, ethernet

Table 1: Application/Bandwidth Tradeoffs

Referring now to Fig. 3, there is shown a flow diagram illustrating the data flow 300 of a telephone call combiner operation implemented by the base station of the system of Fig. 1, in accordance with an embodiment of the present invention, utilizing phone call linear combiner 230 and under the control of PC 140. Data flow 300 illustrates merging of two audio streams (e.g., two phone calls) for conferencing purposes. Combiner 230 operates on decompressed,

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linear PCM data. Data is received in compressed format over the RF channel from the handsets, to save bandwidth, and thus must be decompressed before being applied to combiner 230. The compressed data may be, for example, in adaptive differential pulse code modulation (ADPCM) format. Thus, for example, an RF signal is received by receiver 121 from a handset, to provide an ADPCM signal, and then decompressed by codec 231, to provide a linear PCM signal. A second signal may be provided, also in compressed form (e.g., to save memory), by processor 250 (or from a processor of PC 140), to the decomposition of codec 231 via MUX 301. This may be a signal retrieved from memory, that is to be combined with the handset audio signal, or another handset signal that after being processed by processor 250. Combiner 230 can then combine two or more of the signals from the handset, from processor 250, or from an external telephone line (POTS A/D line, via codec 210). The combined or merged signal is then transmitted out to the appropriate recipients. Alternatively, all audio signals could be transmitted via interface 254 to PC 140, for combining, or for compression and decompression.

One skilled in the art will recognize that the wireless system described above according to the principles of the invention may be a cellular system where base unit 110 represents a base station serving one of the cells in a cellular telephone network.

It will be understood that various changes in the details, materials, and arrangements of the parts which have been described and illustrated above in order to explain the nature of this invention may be made by those skilled in the art without departing from the principle and scope of the invention as recited in the following claims.

CLAIMS

1. A wireless telephone system, comprising:

(a) one or more wireless handsets, each handset comprising a
5 handset transceiver; and

(b) a base unit comprising a base transceiver for communicating
over an RF channel with each handset via its handset
transceiver; and an interface for interfacing with an
external computer, wherein the computer, when
10 interfaced with the base unit via the interface, can control
an operation of the wireless telephone system.

2. The system of claim 1, wherein the one or more wireless
handsets comprises a plurality of wireless handsets.

3. The system of claim 2, wherein the base transceiver
establishes a time-division multiple access (TDMA) link over said RF
channel with each handset via the handset transceiver in accordance
with a TDMA epoch allocating exclusive audio packet time slots to
20 each handset.

4. The system of claim 1, wherein the operation of the system
by the computer includes accessing features and data flows of the
system via the interface.

5. The system of claim 1, wherein the computer provides one or
more features to the system, the system further comprising an
external port coupled to interface, the external port and the interface
having a bandwidth sufficient to support the provided features.

6. The system of claim 1, further comprising a second interface for interfacing with a second wireless telephone system.

5 7. The system of claim 1, wherein the computer, when interfaced with the base unit via the interface, provides one or more of the following features to the system: setting up an initial telephone system configuration; storing a current set up configuration locally; recording data from selected data flows within the system; selectively
10 routing and combining telephone calls and lines of the system; providing voice mail functions; providing conference calling functions; performing locally data compression or decompression for telephone system data; providing a hardware assist with a local computer processor to a base unit processor of the base unit; and providing for
15 caller ID-based call routing and screening.

8. In a base unit of a wireless telephone system having the base unit and one or more wireless handsets, the base unit comprising a base transceiver, each handset comprising a handset transceiver, a
20 method comprising the steps of:

- (a) communicating over an RF channel with each handset via the base transceiver and the handset transceiver;
- (b) interfacing with an external computer via an interface of the base unit; and
- 25 (c) controlling, with the interfaced external computer, an operation of the wireless telephone system.

9. The method of claim 8, wherein the one or more wireless handsets comprises a plurality of wireless handsets.

10. The method of claim 9, wherein step (a) comprises the step of establishing, with the base transceiver, a TDMA link over the RF channel with each handset via the handset transceiver in accordance
5 with a TDMA epoch allocating exclusive audio packet time slots to each handset.

11. The method of claim 8, wherein step (c) comprises the step of accessing features and data flows of the system via the interface.
10

12. The method of claim 8, wherein step (c) comprises the step of providing one or more features to the system, the system further comprising an external port coupled to interface, the external port and the interface having a bandwidth sufficient to support the
15 provided features.

13. The method of claim 8, comprising the further step of interfacing with a second wireless telephone system via a second interface, under the control of the computer, to increase the size of
20 the system.

14. The method of claim 8, wherein step (c) comprises the step providing one or more of the following features to the system: setting up an initial telephone system configuration; storing a current set up configuration locally; recording data from selected data flows within the system; selectively routing and combining telephone calls and lines of the system; providing voice mail functions; providing conference calling functions; performing locally data compression or decompression for telephone system data; providing a hardware assist with a local computer processor to a base unit processor of the base unit; and providing for caller ID-based call routing and screening.

15. A base unit of a wireless telephone system comprising the base unit and one or more wireless handsets, each handset comprising a handset transceiver, the base unit comprising:

- (a) a base transceiver for communicating over an RF channel with each handset via its handset transceiver; and
- (b) an interface for interfacing with an external computer, wherein the computer, when interfaced with the base unit via the interface, can control an operation of the base unit.

16. The base unit of claim 15, wherein:

the one or more wireless handsets comprises a plurality of wireless handsets; and

5 the base transceiver establishes a time-division multiple access (TDMA) link over a shared RF channel with each handset via the handset transceiver in accordance with a TDMA epoch allocating exclusive audio packet time slots to each handset.

10

17. The base unit of claim 15, wherein the operation of the base unit by the computer includes accessing features and data flows of the base unit via the interface.

15 18. The base unit of claim 15, wherein the computer provides one or more features to the base unit, the base unit further comprising an external port coupled to interface, the external port and the interface having a bandwidth sufficient to support the provided features.

20

19. The base unit of claim 15, further comprising a second interface for interfacing with a second wireless telephone system, under the control of the computer.

20. The base unit of claim 15, wherein the computer, when interfaced with the base unit via the interface, provides one or more of the following features to the base unit: setting up an initial
5 telephone system configuration; storing a current set up configuration locally; recording data from selected data flows within the base unit; selectively routing and combining telephone calls and lines of the system; providing voice mail functions; providing conference calling
10 functions; performing locally data compression or decompression for telephone system data; providing a hardware assist with a local computer processor to a base unit processor of the base unit; and providing for caller ID-based call routing and screening.

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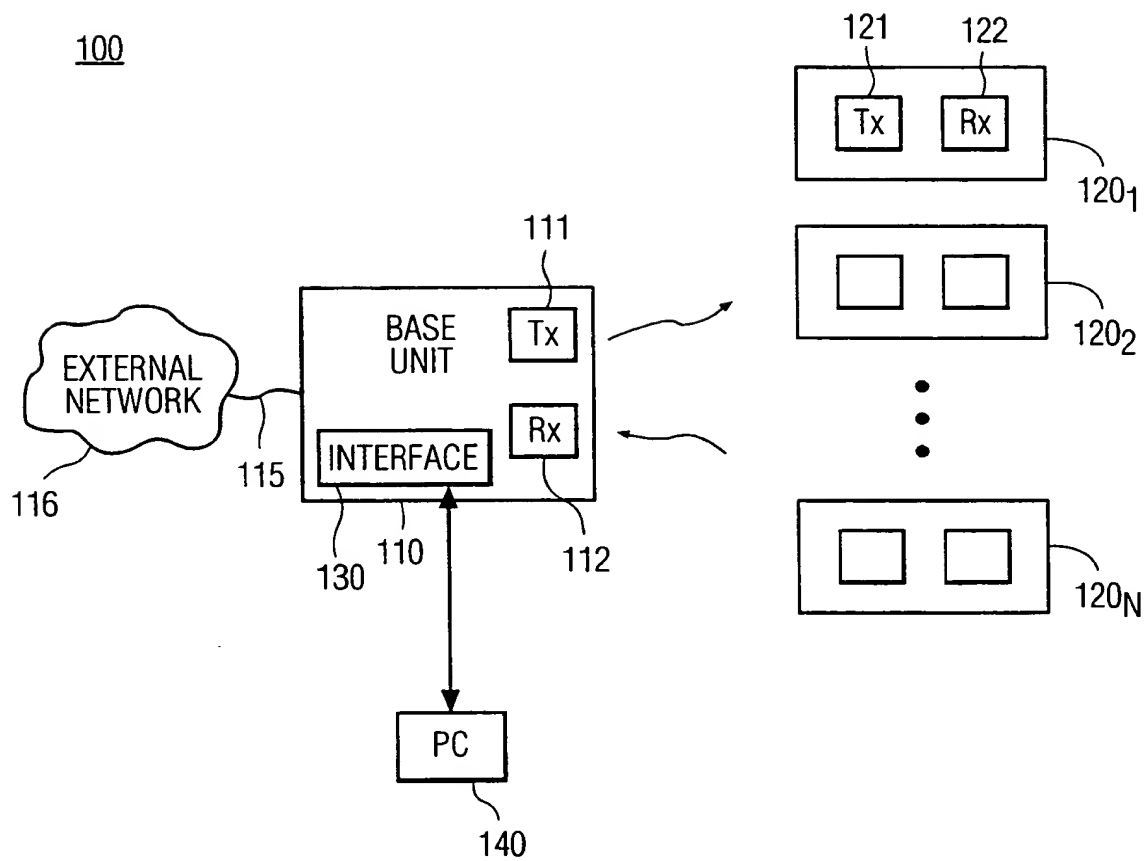


FIG. 1

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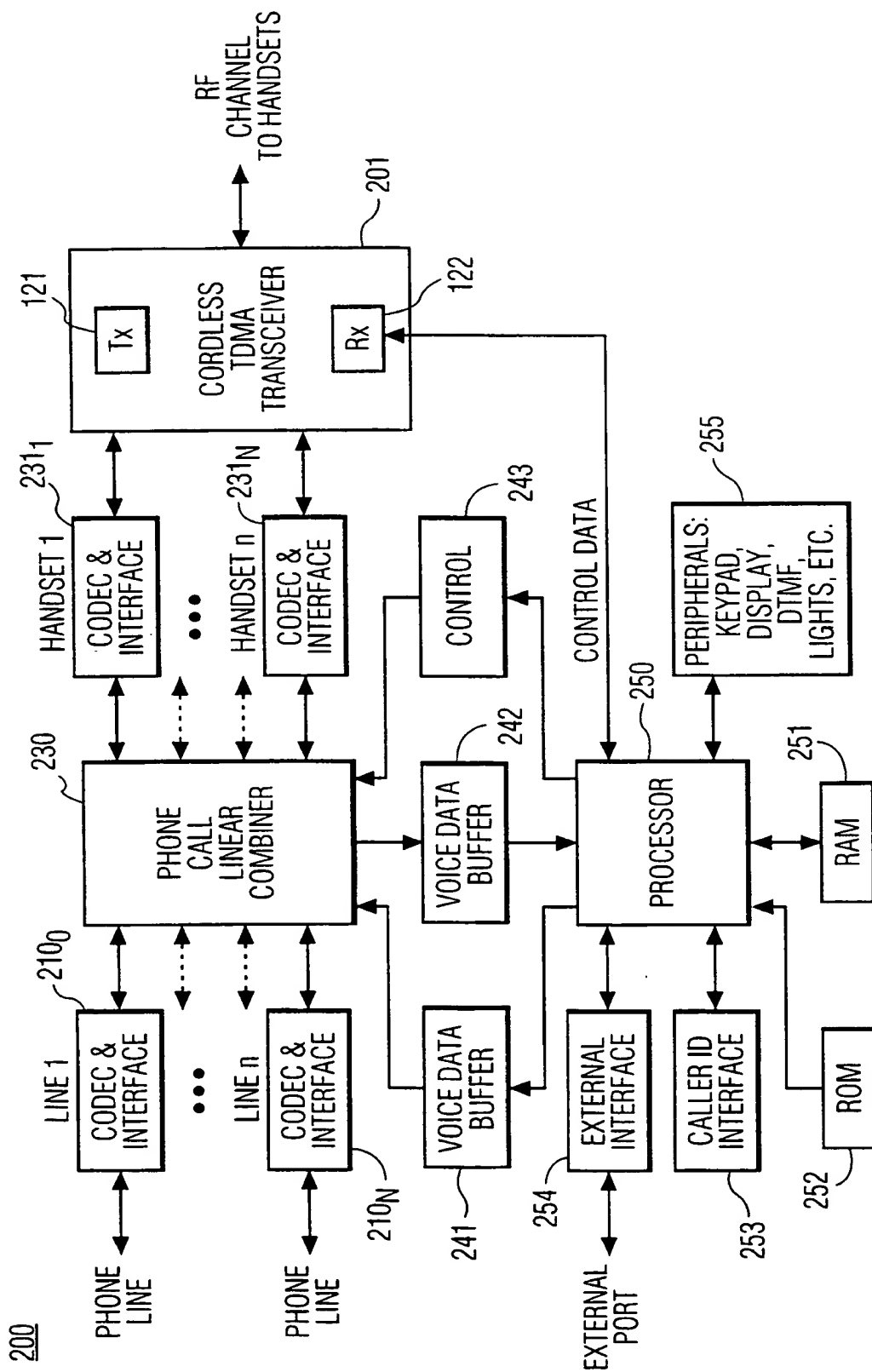


FIG. 2

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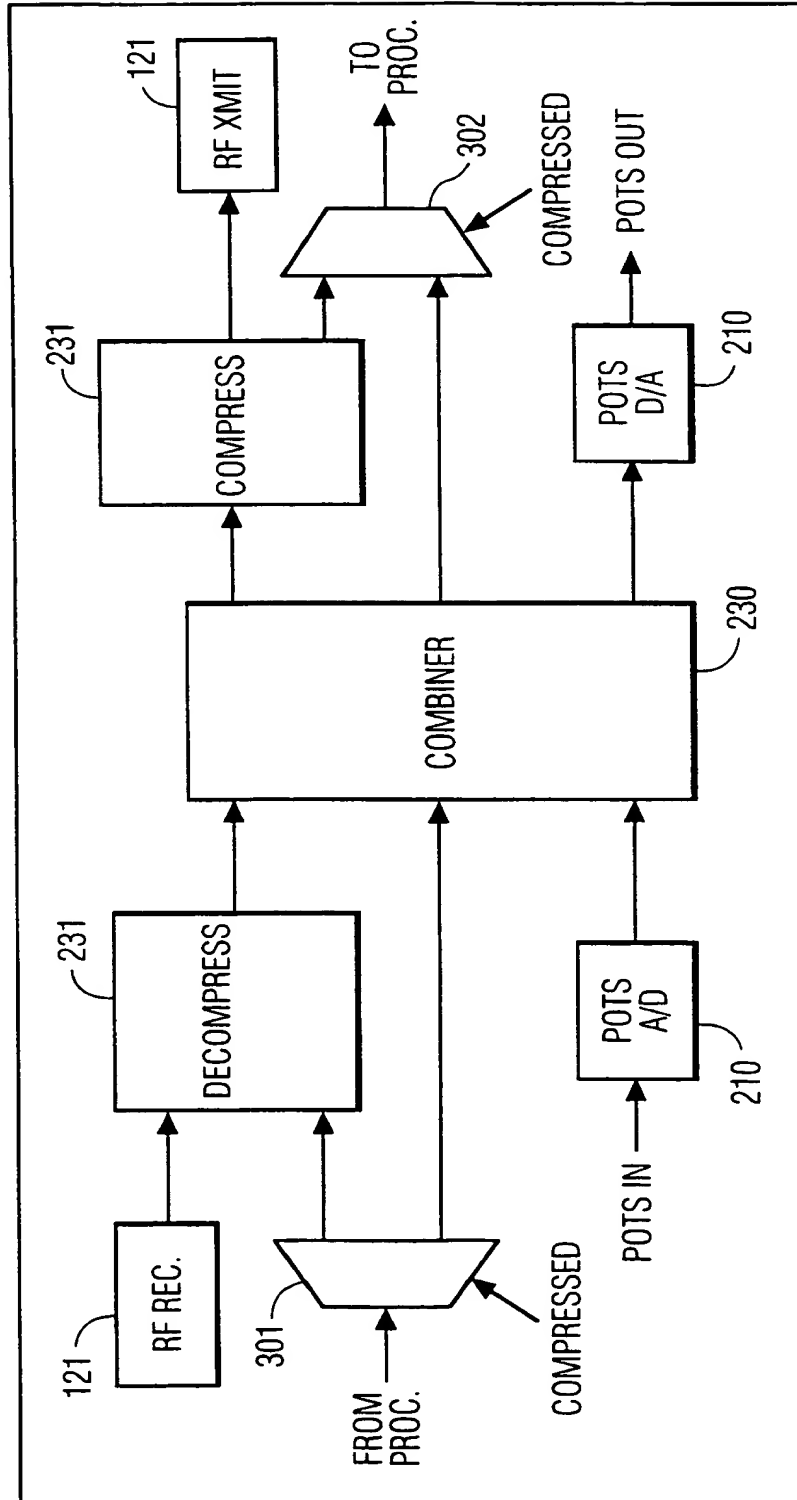


FIG. 3

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/18088

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04B7/26 H04M1/72

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04B H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	WO 98 39941 A (ERICSSON GE MOBILE INC) 11 September 1998 see abstract see page 1, line 1 - page 3, line 7 see page 4, line 16 - line 32 see claims 1,2; figures 1,2 ---	1-20
X	PATENT ABSTRACTS OF JAPAN vol. 098, no. 002, 30 January 1998 & JP 09 284380 A (SONY CORP), 31 October 1997	1,2,4,5, 7-9,11, 12,14, 15,17, 18,20 3,10,16
Y	see abstract ---	3,10,16
Y	EP 0 399 611 A (PHILIPS ELECTRONICS UK LTD ;PHILIPS NV (NL)) 28 November 1990 see abstract see claim 1; figures 1,2 ---	3,10,16
-/--		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Int'l Application No
PCT/US 98/18088

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>EP 0 593 118 A (KONINKL PHILIPS ELECTRONICS NV) 20 April 1994 see abstract see column 2, line 17 - line 22 see column 3, line 1 - line 8 see claim 5; figures 1,4 -----</p>	<p>1,2,8,9, 15</p>

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/18088

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9839941 A	11-09-1998	AU 6540498 A	22-09-1998
EP 0399611 A	28-11-1990	GB 2232326 A	05-12-1990
		DE 69025353 D	28-03-1996
		DE 69025353 T	19-09-1996
		JP 3050926 A	05-03-1991
		US 5200956 A	06-04-1993
EP 0593118 A	20-04-1994	JP 6209281 A	26-07-1994
		SG 44867 A	19-12-1997
		US 5528667 A	18-06-1996